



Questioning

Starter....

- ▶ Think for 2 mins: Why do we ask questions in science lessons?
- ▶ Make a list of reasons why we might ask questions.

Session Objectives

1. Consider why we ask questions.
 - A. Rosenshine Principles (2012)
 - B. Deans for Impact (2015)
2. Consider a range of questions that might be asked in a lesson to improve pupil learning.
3. Consider questions trainees might encounter when observing an expert colleague.

Learn that....

- ▶ Questioning is an essential tool for teachers;
- ▶ ...it can be used for many purposes, including
 - ▶ to check pupils' prior knowledge,
 - ▶ assess understanding and
 - ▶ break down problems

Learn how to....

- ▶ Including a range of types of questions in class discussions to extend and challenge pupils (e.g. by modelling new vocabulary or asking pupils to justify answers
- ▶Reframing questions to provide greater scaffolding or greater stretch.

Learn how to....

- ▶ Providing appropriate wait time between question and response where more developed responses are required.

Essential Readings

1. Rosenshine, B. (2012) Principles of Instruction: Research-Based Strategies That All Teachers Should Know. American Educator, 36(1), p12-39.
2. Deans for Impact (2015) The Science of Learning [Online] Accessible from: Link [retrieved 1 September 2023].



Questions teachers ask...

- ▶ Have you got your book?
- ▶ Did you do your homework?
- ▶ Why did you shout out?
- ▶ Why are you standing up?
- ▶ Do you understand?

Are these questions necessary?

(How) Do they contribute to the lesson?

Rosenshine (2012)

- ▶ Presents 10 principles of instruction that will be evident in many schools (to a greater or lesser extent).
- ▶ They are based on 3 sources of evidence
 - Cognitive science
 - 'master teachers'
 - Cognitive support procedures (e.g. scaffolding)

Principles 3 & 6

- ▶ 3. Ask large numbers of questions and check the responses of all pupils.
 - This allows pupils to practice new knowledge and connect new knowledge to prior learning.

- ▶ 6. Check for pupil understanding
 - This allows pupils to learn material with fewer errors.

Principle 3

- ▶ Ask large number of questions that determine what has been learned in the lesson.
- ▶ Develop depth of understanding by explaining how the answer is known.
- ▶ Involve pupils by
 - Mini boards
 - Hands up to answer or to check
 - Traffic light cards

Principle 6

- ▶ Check for understanding at specific points
 - Think pair share
 - Summarise learning
 - Make connections between new and prior learning
 - Identify gaps or misconceptions

Deans for Impact

- ▶ Information is often withdrawn from memory just as it went in.
- ▶ We usually want students to remember what information means and why it is important, so they should think about meaning when they encounter to-be-remembered material.



Deans for Impact

- ▶ Teachers can assign students tasks that require explanation (e.g., answering questions about how or why something happened) or that require students to meaningfully organize material.
- ▶ These tasks focus students' attention on the meaning of course content.

Scenario...

- ▶ Teacher asks pupil A (who is at the front of the class) to describe the difference between a simple circuit and a parallel circuit.
- ▶ Pupil A gives answer – “I don’t know”
- ▶ Teacher asks Pupil B (who is next to pupil A) the same question.
- ▶ Pupil B answers there are more bulbs in a parallel circuit.
- ▶ Teacher says “yes, maybe”, but not always, so the answer is.....



Some common questions

- ▶ What is the name of the bone in your upper arm?
- ▶ What is the molecular formula of water?
- ▶ What is the unit of force?
- ▶ What is the difference between a simple and a parallel circuit?
- ▶ Explain the difference between voltage and current?
- ▶ What is the difference between exothermic and endothermic reactions?



Developing the question

- ▶ Re-word the same questions to provide challenge or to scaffold thinking.
- ▶ 10 mins in groups of 3.



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Question stems...

- ▶ **In what ways** is a national speed limit on the motorway related to safety or environmental issues?
- ▶ **Do you think** the the national speed limit is too slow?
- ▶ **What speed would you chose and why?**
- ▶ **Why did the** spring extend when I added mass to it?
- ▶ **Is there a limit to** how much mass can I add to this spring?
- ▶ **Compare** series and parallel circuits in terms of current.



Structure questioning

What is_____? E.g. What is the unit of force?

Can you summarise ____ in your own words? Can you summarise Newtons second law in your own words?

How is ____ related to ____? How does temperature affect how quickly the sugar dissolves?

How can we prove____ How can we prove light is a limiting factor on the rate of photosynthesis?

Design____ Can you design an experiment that proves x and y are linked?

Do you agree with_____ Why/why not. What evidence to you use to justify your view? Should the speed limit on motorways be changed? What evidence will you use to support your recommendation? How would you critique the evidence others use?



Issues with questions

- ▶ Guess what is in my head!
- ▶ Non-verbal feedback (facial / auditory) – response to incorrect answers.
- ▶ Dealing with misconceptions
- ▶ Focus on a 'safety' zone
- ▶ Waiting long enough for an answer... **5 seconds**
 - Think / Pair / Share
- ▶ Managing behaviour while asking questions.
- ▶ Who is answering the questions?
- ▶ ***Where do pupils source the answer to questions asked?***



Some considerations

Classroom interactions self-evaluation template

Research by the Institute of Physics suggests that boys tend to dominate in the classroom, answering more questions and getting more of the teacher's attention, usually without the teacher being aware of any imbalance. This template will help you to assess your own practice.

If you are comfortable doing so, you may find it useful to invite a colleague or student to complete the template for you during a lesson.

Date: _____

Class: _____

	Boys	Girls	Notes
Number in class			
Hands up			
Questions directed at			
Answers called out by			

- ▶ Monitor your own questioning in a lesson.

Next steps, where does it link?

- ▶ PS essay on questioning. Observe the style of questions asked in school.
- ▶ Writing your lesson plans and planning your questions. (*Essential in your planning*)
- ▶ Writing questions for working scientifically skills



How will today's session
influence your future
practice?